PROLAPSE OF THE UMBILICAL CORD*

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Prolapse of the umbilical cord is a not uncommon, yet a most serious, complication of labour. It constitutes an obstetrical emergency, severely imperilling the life of the foetus, and is associated with a high foetal mortality rate, which, however, may be reduced if correct treatment is instituted promptly. A statistical survey has been made of the cases of prolapse of the cord occurring in the obstetrical hospitals under the aegis of the University of Cape Town during the 3 years 1953, 1954 and 1955. This study follows the survey made by Joubert,[1] who analysed the cases of prolapse of the cord in the period of 5½ years from 1 January 1948 to 30 June 1953. The new series covers the cases in the 3-year period from 1 July 1953 to 30 June 1956. In the tables statistics are given for the 1st series (1948-53) and the

* From an address delivered at a meeting of the Cape Western Branch of the Medical Association of South Africa, Cape Town, 28 September 1956.

TABLE III. INCIDENCE OF PROLAPSED CORD AND FOETAL MORTALITY AS RELATED TO ANTENATAL CARE

	Total Cases of Prolapse			*No. of Stillbirths*			*Percentage of Stillbirths*		
	1st Series	*2nd Series*	*Total*	*1st Series*	*2nd Series*	*Total*	*1st Series*	*2nd Series*	*Total*
Booked	92 (45%)	97 (48%)	189 (46%)	47	29	76	51%	30%	40%
Non-booked	111 (55%)	106 (51%)	217 (53%)	76	63	139	68%	59%	63%

2nd series (1953-56); and totals for the whole period of 8½ years.

TABLE I. GENERAL STATISTICS

	1st Series	*2nd Series*	*Total*
Total number of births ..	36,347	22,923	59,270
No. of cases with prolapsed cord	203	203	406
Incidence of prolapsed cord ..	1 in 179 (0·56%)	1 in 109 (0·9%)	1 in 144 (0·8%)
No. of foetal deaths	123	92	215
Foetal mortality (percentage) ..	61%	45%	53%
Total no. of stillbirths (all causes)	1,440	911	2,351
Stillbirths as percentage of total deliveries	4%	4%	4%
Percentage of stillbirths caused by prolapsed cord	8·5%	10%	9·2%

Table I shows that the incidence of prolapse of the cord has increased considerably in the 2nd series—from 1 in 179 to 1 in 109. The uncorrected foetal mortality has been lowered in the 2nd series to 45% from 60%, but the mean of 52% is high. The fact that in the 2nd series 10% of all stillbirths were associated with prolapse of the cord shows that this complication of labour is an important factor in the stillbirth rate.

TABLE II. MORTALITY OF FOETUS IN PROLAPSE CASES IN WHICH FOETAL HEART WAS HEARD ON ADMISSION

	1st Series	*2nd Series*	*Total*
Total no. of cases	203	203	406
No. of cases where foetal heart heard	131	146	277
No. of living infants	80	111	191
Live infants as percentage of total cases	39%	55%	47%
Live infants as percentage of cases where foetal heart heard	61%	76%	68%

In Table II it is demonstrated that there is an increased foetal salvage in the 2nd series in those cases in which the foetal heart was heard on admission; 76% of the infants survived, as compared with 61% in the 1st series.

In Table III the number of cases who received antenatal care (the 'booked cases') is shown and the manner in which the foetal mortality is affected by such supervision. The foetal mortality is much higher in non-booked cases. In the 2nd series the figures for non-booked cases reflect twice as many foetal deaths as those for booked cases.

AETIOLOGY

Prof. James Louw[2] teaches that if the lower uterine segment and cervix are not well applied to the presenting part it is understandable that the toneless organ within the amniotic sac can either drop out by force of gravity or can be washed out by the flow of the liquor. Conditions predisposing to poor application of the lower segment and cervix are therefore indirectly responsible for prolapse and, by inference, presentation of the cord. Inferior lower uterine application may be due to *poor muscular tone*. This is evidenced by the fact that there was a higher incidence of prolapse of the cord in multiparous patients, viz. 4·7 to 1 primapara in the 1st series and 4 to 1 in the 2nd series. In our institutions multiparae outnumber primiparae by 2·5 to 1.

If the lower segment does not find suitable area and volume around which to mould itself neatly and efficiently, e.g. in malpresentation, or if there are high mobile presenting parts (disproportion included), the chances of prolapse of the cord are greater. A study of Table IV bears out the truth of this concept. In 210 cases *malpresentation or malposition* was associated with prolapse of the cord. With *prematurity*, the uterus and genital tract in most cases are not completely ready for labour; hence the cord may prolapse either because the head remains high and mobile or because applica-

TABLE IV. AETIOLOGICAL FACTORS

	1st Series	*2nd Series*	*Total*
1. Malpresentations and Malposition			
(*a*) Transverse and Oblique Lie	42 (21%)	41 (21%)	83 (21%)
(*b*) Breech	54 (27%)	40 (20%)	94 (23%)
(*c*) Compound Presentation	11 (5%)	3 (1%)	14 (3%)
(*d*) Persistent Occipito-posterior	9 (4%)	10 (5%)	19 (4%)
	116 (57%)	94 (47%)	210 (51%)
2. Unknown	56 (28%)	66 (33%)	122 (30%)
3. Prematurity	47 (23%)	42 (21%)	89 (22%)
4. High Mobile and Disproportion	16 (8%)	26 (13%)	42 (11%)
5. Multiple Pregnancy	12 (6%)	26 (13%)	38 (10%)
6. Placenta Praevia	10 (5%)	4 (2%)	14 (3%)
7. Manipulation *	1 (0·5%)	4 (2%)	5 (1·5%)

* In 2nd series, 2 cases of artificial rupture of the membranes and 2 of rotation.

tion to the presenting part is poor until later in labour. In 30% of cases the cause of the prolapsed cord was *unknown*. If these patients had received regular antenatal supervision and been seen early on in labour, the cause might no doubt have been found in many of them. In *multiple pregnancy* it is not difficult to imagine why the cord should stand an added risk of prolapsing. Poor relationship between the presenting part and the lower segment and cervix may be found because the necessary uterine distension for accommodating two or more infants and their sacs do not allow proper application of the lower segment to the first born. Inferior retraction and contraction may be responsible for the same phenomenon occurring during the labour for the subsequent baby. In inferiorly managed cases incidence of malpresentation—a condition which predisposes to cord prolapse—is high. It is well known that the cord is often eccentrically and lowly implanted in *placenta praevia*. When the membranes rupture the gush of fluid is all that is required to wash the cord into and through the os and vagina. During *internal manipulations*, a dwindling art of obstetrics, the cord may readily prolapse. It is of interest to note that when labour is induced mechanically prolapse of the cord is but a rare occurrence—so rare that it cannot be considered a contra-indication to induction of labour. During the years 1953 and 1954, 847 'surgical' inductions were performed in this unit, and the cord prolapsed in only 2 cases.

PROGNOSIS

The prognosis in prolapse of the cord depends upon the presentation, the stage of cervical dilatation, and the maturity of the foetus as well as its condition as assessed by the foetal heart-tones and heart-rate. These factors, and their effects on the foetal mortality, are analysed in Table V. Here it is demonstrated in both series, that breech presentation carries the best prognosis for the foetus. With prolapse 60% of the infants were born alive in breech presentations as compared with 47% in cephalic presentation and 40% in transverse lie. Compound presentations carry a poor survival rate (11%). It can also be seen that foetal survival has improved in all presentations in the 2nd series. This improvement is attributed to a relative change in treatment adopted during the latter years.

In Table VI the condition of the cervix as related to foetal mortality is analysed. With complete dilatation there is a higher foetal survival rate in both series. The 2nd series show a higher survival rate in both complete and incomplete cervical dilatation. The lesson taught by Joubert's paper[1] certainly had its effect.

In Table VII the relation of maturity to foetal mortality is shown. The premature infant has, as is expected, less chance of survival than its mature counterpart. The considerable improvement in both mature and premature foetal survival rate in the 2nd series is obvious.

TREATMENT

This depends upon whether the foetus is alive or not. If the foetus is dead, delivery should be effected with the minimum of harm to the mother; for instance, if all else is normal, natural delivery should be allowed. In the presence of marked disproportion, however, or a tightly contracted uterus over a foetus lying transversely, Caesarean section should be performed. That is to say, treatment under these circumstances depends entirely on the maternal indications for natural delivery or

TABLE V. PROLAPSED CORD AND FOETAL SURVIVAL ACCORDING TO PRESENTATION

Presentation	*Total Cases of Prolapse*			*No. Survived*			*Percentage Survival*		
	1st Series	*2nd Series*	*Total*	*1st Series*	*2nd Series*	*Total*	*1st Series*	*2nd Series*	*Total*
Cephalic	94	119	213	33	68	101	35	57	47
Breech	52	40	92	29	26	55	56	65	60
Transverse Lie	42	41	83	16	17	33	38	41	40
Compound	15	3	18	2	0	2	13	0	11
Total	203	203	406	80	111	191	39	55	47

TABLE VI. CONDITION OF CERVIX AND FOETAL MORTALITY

Dilatation of Cervix	*Total Cases of Prolapse*			*% Incidence*			*No. Living*			*% Survival*		
	1st	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*
Complete	104	78	182	51%	38%	45%	46	49	95	45%	63%	54%
Incomplete ..	99	125	124	49%	57%	53%	37	62	99	37%	50%	43%

TABLE VII. PREMATURITY AND FOETAL MORTALITY

Maturity	*Total Cases of Prolapse*			*% Incidence*			*Foetal Deaths*			*% Mortality*		
	1st	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*
Premature.. ..	47	42	89	23%	21%	22%	35	22	57	74%	52%	63%
Mature	156	161	317	77%	79%	78%	80	70	150	51%	43%	47%

TABLE VIII. RESULTS OF TREATMENT WITH FOETAL HEART HEARD AND AN INCOMPLETELY DILATED CERVIX

Presentation and Treatment	*Live*			*Dead*			*Total*		
	1st	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*
Cephalic Presentation									
Conservative (cord replacement, etc.) ..	1	4	5	7	10	17	8	14	22
Version (internal or bipolar)	6	0	6	8	1	9	14	1	15
Caesarean section	6	37	43	0	4	4	6	41	47
	13	41	54	15	15	30	28	56	84
Breech Presentation									
Conservative (cord replacement, etc.) ..	11	4	15	9	1	10	20	5	25
Caesarean section	1	8	9	0	0	0	1	8	9
	12	12	24	9	1	10	21	13	34
Transverse Lie									
Version (bipolar or internal)	3	2	5	5	7	12	8	9	17
Caesarean section	4	7	11	1	1	2	5	8	13
	7	9	16	6	8	14	13	17	30
Grand Total	32	62	94	26	24	54	62	86	148

interference. Should the foetal heart be heard, treatment will depend upon cervical dilatation. The results of treatment in the cases in which the foetal heart was heard and the cervix was incompletely dilated are shown in Table VIII. The foetal salvage rate is poor in all presentations where conservative treatment was employed. (By conservative treatment is meant cord replacement, postural treatment or spontaneous delivery in longitudinal presentations.) In most of these cases, where live infants were obtained the cervix was nearly fully dilated and natural delivery permitted. The live infants obtained where internal version was performed were in cases in which the cervix was nearly fully dilated. In only 2 cases was bipolar version rewarded with a live infant. The highest foetal salvage rate was obtained when Caesarean section was performed. It can be seen that, out of 69 Caesarean sections, 63 infants survived whereas out of 79 cases treated conservatively or by version, only 31 survived. Section was employed far more frequently in the 2nd series with a resulting dramatic improvement in foetal salvage.

The results of treatment when foetal heart was heard and the cervix completely dilated are shown in Table IX. As can be observed, Caesarean section had a very small place in treatment; prolapse of the cord obviously is not an indication for this operation under these circumstances. In the vertex presentation, the infant should be delivered as soon as possible. In a multiparous patient, vigorous bearing-down may be all that is required. With the slightest delay an episiotomy is done. If there is further delay, forceps are applied. Providing that labour is progressing rapidly, assistance with the breech in these presentations is essential. If progress is slow, extraction is imperative. In transverse presentations, internal version with breech extraction gives good results, i.e. providing the uterus relaxes normally.

SUMMARY

1. 406 cases of prolapse of the umbilical cord occurring in 59,270 deliveries are analysed and discussed.

2. It is shown that there is an increased foetal salvage-rate in the past 3 years.

3. The various aetiological factors are discussed. The hypothesis of inferior lower uterine tone is stressed.

4. It is shown that with an incompletely dilated cervix

TABLE IX. RESULTS OF TREATMENT WITH FOETAL HEART HEARD AND A COMPLETELY DILATED CERVIX

Presentation and Treatment	*Live*			*Dead*			*Total*		
	1st	*2nd*	*Total*	*1st*	*2nd*	*Total*	*1st*	*2nd*	*Total*
Cephalic Presentation									
Spontaneous	12	16	28	3	4	7	15	20	35
Internal Version	2	0	2	4	1	5	6	1	7
Forceps	2	10	12	4	2	6	6	12	18
Caesarean section	0	1	1	1	1	2	1	2	3
	16	27	43	12	8	20	28	35	63
Breech Presentation									
Assisted delivery	2	5	7	3	0	3	5	5	10
Breech Extraction	11	9	20	6	0	6	17	9	26
Caesarean section	0	0	0	0	0	0	0	0	0
	13	14	27	9	0	9	22	14	36
Transverse Lie									
Internal version	5	8	13	2	2	4	7	10	17
Caesarean section	0	0	0	0	0	0	0	0	0

Caesarean section gives the highest foetal survival-rate, whereas with a completely dilated cervix, vaginal delivery is the treatment of choice.

I wish to thank Prof. James T. Louw, Head of the Division of Obstetrics and Gynaecology in the University of Cape Town, for his constant help and criticism, the medical superintendents of the teaching hospitals concerned for permitting the use of their records, and the University Teaching Board for their grant which made possible the annual reports which have proved of inestimable value in the writing of this paper.

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